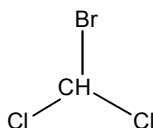


BROMODICHLOROMETHANE

CAS No. 75-27-4

First Listed in the *Sixth Annual Report on Carcinogens*



CARCINOGENICITY

There is sufficient evidence for the carcinogenicity of bromodichloromethane in experimental animals (NTP 321, 1987). When administered by gavage, bromodichloromethane increased the incidences of tubular cell adenomas and adenocarcinomas in the kidney and adenocarcinomas and adenomatous polyps in the large intestine in rats of both sexes. When administered by gavage, bromodichloromethane increased the incidences of tubular cell adenomas and adenocarcinomas in the kidney of male mice and increased the incidences of hepatocellular adenomas and carcinomas in female mice (NTP 321, 1987; ATSDR, 1989-R015).

There are no data available to evaluate the carcinogenic effects in humans following long-term oral exposure to bromodichloromethane per se. There are several epidemiological studies that indicate there may be an association between ingestion of chlorinated drinking water (which typically contains bromodichloromethane) and increased risk of cancer in humans, but these studies cannot provide information on whether any observed effects are due to bromodichloromethane or to one or more of the hundreds of other byproducts that are also present in chlorinated water (ATSDR, 1989-R015).

PROPERTIES

Bromodichloromethane is a colorless liquid that boils at 89.2-90.6 °C. It is soluble in water (4,500 mg/L), alcohol, ether, acetone, benzene and chloroform. Bromodichloromethane is not readily flammable.

USE

Bromodichloromethane is used in the synthesis of organic chemicals and as a reagent in laboratory research (USEPA, 1980; Sittig, 1985). It has also been used to separate minerals and salts, as a flame retardant, and in fire extinguishers (HSDB, 1997).

PRODUCTION

Bromodichloromethane is not used or produced commercially in the United States. Small quantities are produced but quantitative volumes are not available (ATSDR, 1989-R015). The 1998 *Chemical Buyers Directory* lists one supplier of the chemical (Tilton, 1997). Chem Sources identified seven suppliers for 1988-1989 (Chem Sources International, 1988). Import or export figures were also not found, but little, if any, is expected (ATSDR, 1989-R015).

EXPOSURE

The primary potential occupational exposure to bromodichloromethane will be of that workers using the compound as a reagent for research or to synthesize organic chemicals. Most other uses of the chemical have been discontinued (Gosselin et al., 1984). The National Occupational Exposure Survey (1981-1983) estimated that 3,266 workers, including 503 female workers, potentially are exposed to bromodichloromethane (NIOSH, 1984).

Bromodichloromethane is not produced or used on a large commercial scale; it is unlikely that significant release to the environment will result from industrial processes (Perwak et al., 1980). If contamination occurs from a spill on land, volatilization will occur, which is the predominant environmental removal process, or the compound will leach into ground waters, where significant biodegradation can occur under anaerobic conditions (HSDB, 1997). The Toxic Chemical Release Inventory lists seven industrial facilities that produced, supplied, or otherwise used bromodichloromethane in 1987 (TRI, 1989). Five of the seven facilities reported releases to the environment, all of them to the air. The estimated total of bromodichloromethane released was 15,000 lb. Bromodichloromethane has a relatively long half-life in air, estimated to be 2 to 3 months. Reactions with hydroxyl radicals or singlet oxygen are probably the only identifiable transformation processes in the atmosphere (ATSDR, 1989-R015). Long-range global transport is possible. Bromodichloromethane has been detected in rainwater, indicating that washout from the atmosphere is possible; however, it is likely that the compound will revolatilize (HSDB, 1997). The major anthropogenic source of bromodichloromethane is its formation as a result of the chlorination treatment of drinking, waste, or cooling waters (Perwak et al., 1980). Trihalomethanes (THMs) are generally present in the finished water treated with chlorine (Kirk-Othmer V.24, 1984). The amount of bromodichloromethane produced during the chlorination is dependent on temperature, pH, bromide ion concentration of the water, THM precursors, and actual treatment processes. The organic THM precursors are naturally occurring humic, tannic, and fulvic acids (Kirk-Othmer V.16, 1981; ATSDR, 1989-R015).

The general population is exposed to the compound through consumption of contaminated drinking water, beverages, and food products and inhalation of contaminated ambient air. No permissible exposure limits in air have been set. Bromodichloromethane is regulated as a trihalomethane by the EPA. The maximum permissible concentration allowed in finished water for total trihalomethanes is 0.1 mg/L. THMs were detected in 78 of 80 city water supplies (Kirk-Othmer V.16, 1981). The concentrations of the halogenated hydrocarbons were higher in the finished water than in the raw waters. The highest detected concentration of bromodichloromethane in New Orleans drinking water for raw water is 11 µg/L and 116 µg/L for finished water (NRC, 1980). It is estimated that bromodichloromethane levels increase by 30%-100% in water distribution pipes; formation of bromodichloromethane is likely to continue as long as chlorine and organic THM precursors remain in the water (ATSDR, 1989-R015). Bromodichloromethane was detected in 445 of 945 finished water supplies from groundwater sources; the median level was approximately 1.8 ppb (HSDB, 1997). Bromodichloromethane was detected in 35 of 40 Michigan water supplies at a median concentration of 2.7 ppb (Furlong and D'Itri, 1986). The EPA surveyed the water supplies of 113 U.S. cities in 1976-1977; median levels of bromodichloromethane were 5.9 to 18 ppb (USEPA, 1980). Concentration of bromodichloromethane in 14 of 63 industrial wastewater discharges ranged from < 10 to 100 ppb (Perry et al., 1979).

Exposure can also occur from dermal contact with and ingestion of chlorinated swimming pool water; the portion of the population that frequents indoor swimming pools and saunas is at potentially higher risk from inhalation exposure (ATSDR, 1989-R015). Levels of 13 to 34 µg/L were detected in chlorinated freshwater pools (Beech et al., 1980). Lindstrom et al. (1997)

examined dermal and inhalation exposures of two college students (one male and one female) during a typical two-hour swimming workout. The results suggested the dermal pathway as the major means of exposure versus the inhalation route and showed a measurable body burden of bromodichloromethane connected with training.

Although consumers are potentially exposed to bromodichloromethane from contaminated food, resulting from use of chlorinated water to produce these foods, it is not common and is at low levels (HSDB, 1997). In a survey conducted for FDA, bromodichloromethane was detected in 4 of 39 food products, including one composite dairy food (1.2 ppb), butter (7 ppb), and two beverages (0.3-0.6 ppb) (Entz et al., 1982). Cola drinks were found to contain 2.3-3.8 ppb. Bromodichloromethane was detected in noncaramel-colored soft drinks (0.1-0.2 ppb) and in cola drinks (0.9-5.9 ppb) (Abdel-Rahman, 1982).

REGULATIONS

EPA regulates bromodichloromethane under the Clean Water Act (CWA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), Safe Drinking Water Act (SDWA), and Superfund Amendments and Reauthorization Act (SARA). Bromodichloromethane is a toxic pollutant of water. EPA has established water quality criteria for bromodichloromethane, effluent guidelines, rules for regulating hazardous spills, general threshold amounts, and requirements for handling and disposal of bromodichloromethane, rules for regulating hazardous spills, general threshold amounts, and requirements for handling and disposal for bromodichloromethane under CWA and CERCLA. Bromodichloromethane is regulated as a hazardous constituent of waste under RCRA. EPA established a maximum contaminant level (MCL) of 0.1 mg/L for total trihalomethanes under SDWA. FDA has set the permissible level of trihalomethanes in bottled water at 0.1 mg/L. OSHA regulates bromodichloromethane under the Hazard Communication Standard and as a chemical hazard in laboratories. Regulations are summarized in Volume II, Table B-15.